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ABSTRACT

One of a three-volume series concerning the development and testing of a model for determining the costs of vocational education programs and courses, this executive summary is process-oriented and divided into two parts. Part 1 describes the scope of the study and includes delimiting criteria for field test sites, process characteristics of the model, and program cost calculations. Part 2 discusses the two major products of the study--a final report and an executive summary, and a user's manual. The final report, summarized chapter by chapter, focuses on results of the program data, student accounting, fiscal accounting, and the conclusions derived from the results in all three areas. (VB)

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THE DEVELOPMENT AND TESTING OF A MODEL FOR DETERMINING THE COSTS OF VOCATIONAL EDUCATION PROGRAMS AND COURSES

EXECUTIVE SUMMARY

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EXECUTIVE SJMMARY

Background

Analyses of program costs is an art as old as civil government itself. Like other developmental practices, the state-of-the-art changes as a function of recognized need among practitioners. The Bureau of Occupational and Adult Education (BOAE) has for a number of years provided "seed" monies to state departments of education for the purposes of initiating and extending the uses of management information systems (MIS) associated with planning, evaluating, and managing vocational-technical education programs. The state-of-the-art of MISs for vocational education was recently reported by Starr, Black, and Gray (1977). One finding of those researchers particularly related to the purposes of this study was that "...program cost data, essential for program planning purposes, were found in the data bases of only 12 states."

The development and maintenance of comprehensive management information systems are no mean tasks. Although the above cited researchers also reported that "...only 6 states had adequate or near adequate MIS data bases," they further reported that BOAE initiatives under Part C grants for FY 1974 and FY 1975 directed to MIS purposes did "improve availability of data for program planning and/or evaluations." Therefore, this study may be viewed as another step toward developing greater sophistication among vocational education program planners and managers.

Comprehensive studies of related costs of education programs are of more recent origin. Although the notions of added-costs or cost differentials

may be appropriately credited to Mort's early work on The Measurement of Educational Need (1925), it was the U.S.O.E. sponsored National Educational Finance Project which in 1968 mounted a major research effort to determine relative costs of various education offerings. Stimulated by that effort, other researchers have replicated, modified, and extended that thrust such that our understanding of vocational program cost issues is growing. And, based upon those analyses of program cost relationships, several states have adapted the cost-index (added-cost) type of public school finance funding system, and the federal government has based its support of programs for exceptional children on the added-cost concept (P.L. 94-142). Yet, only one state, Florida, had established a procedure for annually reviewing costs of each vocational education course in each of the state's school districts and community colleges at the time this study was completed.

It was within this context, one of need and one of developing sophistication, that BOAE sought a generalizable model for determining the costs of vocational education programs and courses.

Scope of the Study

The tasks performed in this study were centrally related to the development and field-testing of an "added-cost" model for vocational education programs. The specific dimensions of the study were as follows:

(1) to develop a model for calculating the total costs on a full-time equivalent per student basis for vocational secondary and postsecondary school level courses and programs, and which will permit the analysis of these costs in terms of the basic school program costs; and

(2) to demonstrate the capabilities of the model by using the model to gather and report the vocational program cost data on a number of selected school districts for secondary level offerings and for a number of postsecondary institutions. Also, this task included the reporting of "basic" program costs for school districts and postsecondary institutions.

Further, the study was delimited in terms of the data capabilities of the model, the process characteristics of the model, program cost calculations, and field-test site selection. Each of those delimiters will be briefly discussed.

Data Capabilities of the Model

The model was planned to have the capability of yielding:

(1) the total full-time equivalent student enrollment for each vocational education course and program offering at the secondary and postsecondary school levels by school, school district or postsecondary institution, and for the state as a whole;

(2) the total cost for each vocational education course and program offering at the secondary and postsecondary school levels by school, school district or postsecondary institution, and for the state as a whole;

(3) the total cost for each vocational education course and program offering per full-time equivalent student enrolled at the secondary and postsecondary school levels by school, school district or postsecondary institution, and for the state as a whole;

(4) the total cost per full-time equivalent student enrolled for basic secondary programs by school and by school district and for the basic postsecondary school program in postsecondary institutions offering a basic program; and,

(5) a comparison between the vocational program costs and the basic program costs.

Process Characteristics of the Model

The model was planned to have the following process characteristics:

(1) may be applied by researchers in any state even though the existing financial and student attendance information maintained at the district or institutional levels do not provide the required data; and

(2) may be adapted to existing automated data processing routines by school districts and postsecondary institutions.

Program Cost Calculations

The model was planned to:

(1) identify costs for each course and program by the objects: salaries, employee benefits, purchased services, supplies and materials, other purchases, and capital outlay; and

(2) identify costs as direct and indirect expenses consistent with the object and function classifications of expenditures set forth in Chapter 4, Financial Accounting Classifications and Standard Terminology for Local and State School Systems, Handbook II, Revised, (OE) 73-11800.

Site Selection Criteria for Field-Testing

The delimiting criteria initially established for field-test sites were as follows:

(1) must be selected from no less than four states which are demographically diverse and do not predominately represent one geographical region of the United States;

(2) must be selected from areas representing a range of demographic and geographic conditions including intercity areas, rural, sparsely

populated areas, suburban areas, wealthy and poor areas, areas representing high concentrations of minority students, and areas representing a range in occupational opportunities;

(3) school districts were to be selected which enrolled above 35 percent of their secondary students in vocational education programs;

(4) postsecondary institutions were to be selected which enrolled above 45 percent of their students in vocational education programs; and

(5) the financial and student attendance information systems used in the school districts and postsecondary institutions were to represent a variety of practices.

Products of the Study

The study was planned to yield two major products: (1) a Final Report and an Executive Summary, and (2) a User Manual. This document is the Executive Summary and is characteristic of research and development reporting in that it is process oriented, similar to the Final Report, while the User Manual is application oriented.

The Final Report

The first chapter provides the background and scope of the study along with the project management plan. The initial conceptualization of the project management plan included staff organization and role definitions and statements of tentative tasks related to a Gantt chart which displayed the tentative work schedule associated with those tasks. However, a comprehensive PERT diagram and schedule of project activities and integrating tasks was developed upon award of the contract and is contained in Chapter 1.

The review of literature relating to cost determination of vocational education in contained in over 100 pages of Chapter 2. That substantive review is topically organized as: (1) cost accounting, cost analysis, and cost studies; (2) cost units and considerations of such units; (3) vocational program areas as cost centers; (4) cost elements and classifications of those elements; and (5) cost finding and the analysis of costs.

The value of results indicated by educational cost studies has been increasing in recent years, due to a number of factors. Included among those are firstly, while there is still wide diversity in degree of detail shown in pupil and fiscal accounting data and in the accounting systems used by local education agencies, the quality of such data are improving. Secondly, the increasing use of cost accounting by local education agencies has provided more accurate and readily interpretable information. Thirdly, a number of states have attempted to develop program area cost indices, along with the data gathering systems by which to formulate and maintain the currency of such indices. Fourthly, there has been a refinement of cost study and cost determination techniques.

The difficult tasks of cost finding and cost determination should not be underestimated. The validity of any such determinations depends upon one's ability to locate and/or formulate equivalencies in cost and enrollment data. The data available often vary in form with the purposes of analysis since they may be limited to esoteric state and local reporting requirements.

A further problem in cost studies that attempt to provide a basis for cost determination involves decisions as to collecting and structuring data. Such decisions include (1) determination of practical cost units

which, at the same time, are standardized (or which can be standardized) and provide an effective comparative base; (2) selection of the most practical and effective cost centers; (3) formulation of effective cost elements and categories which will enable effective allocation and interpretation; and (4) the formulation of effective cost allocation and cost-finding techniques which accurately attach expenditures to cost units in cost centers. Particular problems include the treatment of indirect costs, start-up versus operating costs, and capital outlay and equipment costs.

For cost comparison purposes an additional problem relates to the selection of an appropriate referent comparison cost center. At the secondary school level, the "basic" (regular academic) programs appears as the appropriate comparison center. However, problems arise from differences in grade levels included in state and local definition of the basic program. Problems also exist in selecting comparison cost centers for area vocational centers serving secondary and adult students.

Given the purposes of formulation of effective cost determination and cost comparison efforts in relation to vocational education, the literature seems to suggest the following.

1. The most effective cost units appear to be FTE student units based on student contact hours.

2. The cost centers for which accurate data currently exist may be the program area, rather than courses, particularly for indirect costs.

3. Indirect costs are more practically and accurately allocated on a per FTE student basis, rather than on a space or FTE teacher basis. Exceptions may include costs for services to teachers, rather than students.

4. Capital outlay and equipment costs might best be handled, at the present, by memorandum accounting.

5. The basic program may be best defined as instruction other than vocational instruction.

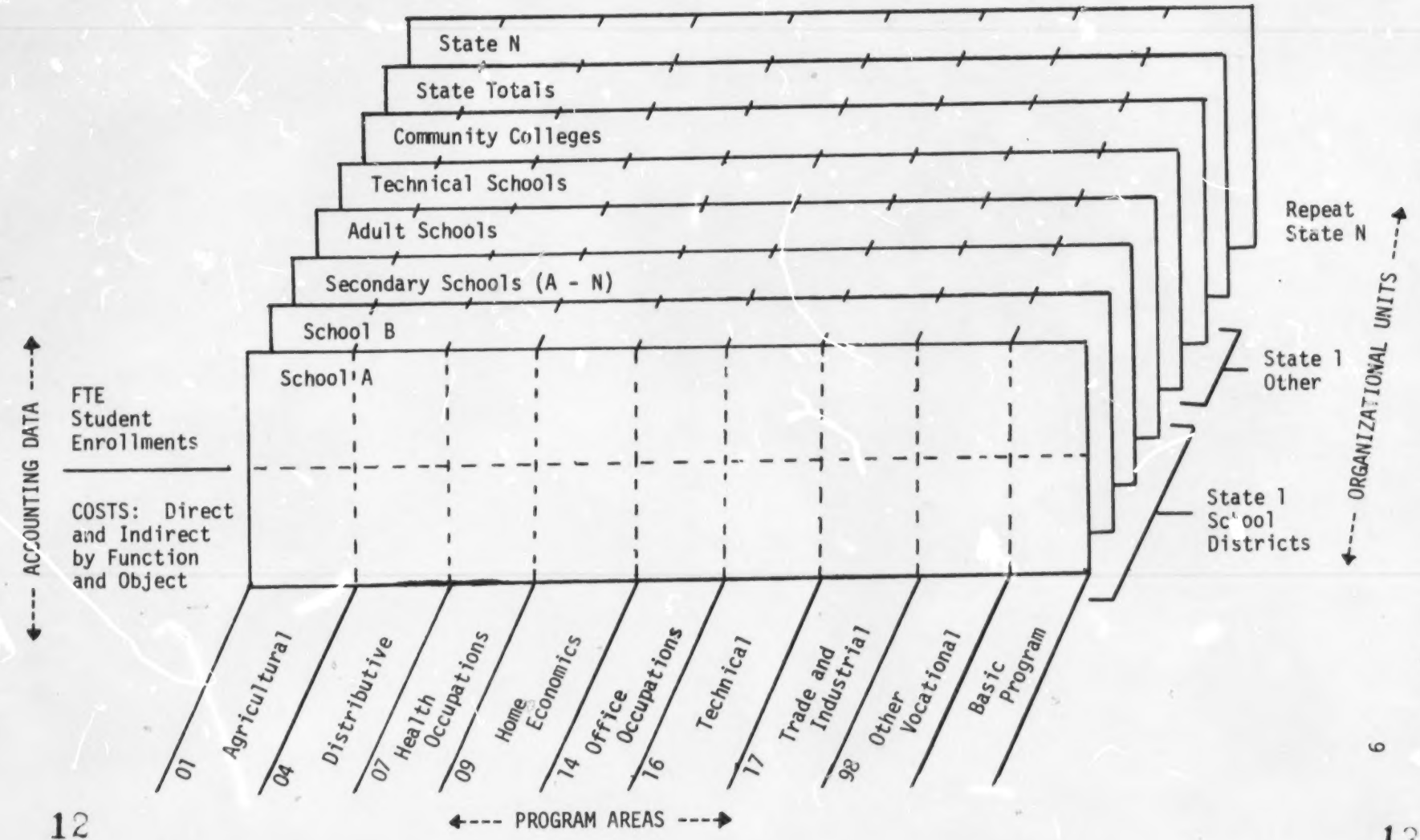
Chapter 3 of the Final Report briefly reviews the preliminary model development and pre-testing, provides a comprehensive statement regarding the field-test site selection, briefly describes the site visitation processes, and provides summaries of the data analysis and findings relative to both the quantitative and qualitative aspects of the data.

Although program area costs and course costs were determined as a result of project activities and provide some insights to programmatic costs at both secondary and postsecondary education agencies, it must be kept in mind that the central purpose of the project was model development and testing. Therefore, readers of Chapter 3 are cautioned that the sample was not intended to be representative of American secondary and postsecondary institutions except as they relate to testing a variety of student and fiscal accounting structures. Certainly, one would not be in a position to recommend fiscal policy based on the expenditure data utilized in the model testing activities.

The format of the site reviews is as follows: (1) program data, (2) student accounting data, (3) fiscal accounting data, and (4) data analysis to determine added-cost relationships. Each section contains an assessment of the data with regard to maximum application of the model and the conversions required to exercise the model.

Chapter 4 contains a brief review of the modeling process and the complete User Manual. The dimensions of the model are illustrated in the crosswalk.

COST OF VOCATIONAL EDUCATION MODEL CROSSWALK



The User Manual contains each of the data forms, general and specific instructions for their completion, a course cost algorithm, sample data classifications, definitions and their sources, and a suggested data processing coding structure. The model was developed within the delimiting characteristics noted above and the objectives established following the literature review, modeling processes, field-tests, and panel reviews. The design is such that electronic data processing is not required to yield the desired results of occupational program area costs and their relationships to "basic" program costs and determination of course costs. However, a prototype data processing coding structure has been defined for local/state adaptations since it was recognized that many educational agencies had already established computer-based systems of student and fiscal accounting; yet, they may not be directed toward added-cost analyses. Therefore, the procedures suggested may contribute to all agencies irrespective of their state-of-the-art in developing management analysis techniques and reporting systems.

Chapter 5 presents the summary and conclusions of the study. The summary was offered in terms of program data, student accounting data, and fiscal accounting data. Those sections of the Final Report are repeated here to close this Executive Summary.

Program Data

Course numbering schemata are esoteric among secondary and postsecondary institutions. For purposes of state reporting of vocational data (student and fiscal,, special purpose data are generated, often requiring a translation of locally developed course numbering schemes into the standard two, four, or six-digits U.S.O.E. structure. Given the data base and data processing sophistication identified at several sites visited, those trans-

lations could be readily accommodated through a simple sub-routine in the data processing design.

The U.S.O.E. course classification system is generally inadequate to distinguish discretely the array of course offerings identified even in the small sample utilized in this project. The problem does not relate so much to the coding structure as much as it relates to assignment of common numbers for common courses. It was observed that consistency was generally unreliable beyond that level of assignment. Also, some educational agencies made no attempt to go beyond the program area designator (e.g., 01.) for reporting purposes. This finding exacerbated the efforts to obtain accurate vocational-technical courses data of interest. However, it was recognized that generally, a course offered at the secondary level was not of the same content and experience offered at the postsecondary level. To assign common course titles in those instances would generate erroneous information and may, in fact, lead to inappropriate decisions based on that information. It was for the latter reason that the model described in Chapter 4 moved the unit-of-analysis from the course level to the program area level and supplemented the analysis by offering a course-cost algorithm for potential users.

No attempt was made throughout this project to relate appropriate vocational-technical courses to U. S. Department of Labor Occupation Codes since that activity would have been well beyond the scope of this project. However, it became increasingly clear to site auditors that program compatibility does not exist between organizational levels (secondary and postsecondary) and often does not exist within organizational levels. It is recognized that vocational educators have addressed this problem in the past and continue to do so; however, for costing purposes, the lack of program

definition requires one to aggregate data at the program area level only, e.g., Agriculture, Health Occupations, and so forth. Even at that level it was observed that some of the same courses were assigned to different program areas.

Student Accounting

The model was tested, by design, at sites which utilized a variety of student accounting practices. The student accounting practice which does the most violence to the integrated data sets is the average-daily-attendance (ADA) method. That statistic tends to understate course and program enrollments between 8 and 10 percent according to our site consultants.

Secondary and postsecondary educational agencies which utilize a full-time-equivalent (FTE) student statistic do so on the basis of one or more specific enrollment surveys. Discussions with site consultants and the literature review both point to the need for student accounting based upon student contact hours. That statistic is the only one identified that relates directly to tasks. Given an appropriate enrollment survey date, irrespective of the length of the course term, the full-time equivalent student enrollment may be computed as follows:

$$\frac{\text{Course Enrollment} \times \text{Course hours/week} \times \text{Course weeks}}{\text{FTE Student/hours/week} \times \text{Annual term in weeks}} = \text{Full-time Equivalent Enrollment}$$

Various applications of the above formula were made throughout this project and it was found to be serviceable both among secondary and post-secondary sites. Also, if a site accounts student populations in terms of days rather than weeks, the formula may be applied on that basis. It should be evident that the product of course-hours/week and course-weeks is the

operational definition of student contact hours per term. Several school districts, area vocational schools, and community colleges computed student contact hours for internal management purposes and one state utilized that statistic for funding purposes.

Fiscal Accounting

A variety of fiscal accounting structures was encountered by site auditors. That was expected since the sample was structured for that purpose (see Chapter 1 criteria). The basic unit of analysis in fiscal accounting structure is dollars per unit, and unit represents a particular object-of-expenditure. The literature review suggested several structures for purposes of expenditure analysis, yet most were consistent with that offered in U.S.O.E.'s Handbook II, Revised.

Particularly troublesome is the problem of relating objects-of-expenditure to courses since accounting structures among educational agencies rarely aggregate data in that manner. Although some agencies visited seem to have incorporated various planning-related elements in their fiscal accounting structures (especially those who utilize the Higher Education General Information System), it is evident that agency comptrollers focus primarily on the control function of accounting.

Although our design for collecting fiscal data sought to relate operations and maintenance expenditures to time-space utilization we found it to be totally impractical at most sites (although one site does that as a matter of routine practice) due to lack of data base relative to space utilization. Also, capital outlay expenditures for buildings, sites, and equipment were fugitive among the majority of sites visited. Only two sites could produce an equipment register identifying all equipment, its program area assignment, and its historical cost (one site computed an

annual depreciation value for each item of equipment).

The cost model presented in Chapter 4 identifies the expenditure elements and attribution bases suggested for cost determination of vocational program areas and "basic" programs. Generally, no economies of scale were evident in the aggregated program area costs.

Conclusions -- Program Data

1. Much work needs to be done by vocational program specialists to establish more compatability among educational agencies in their use of the U.S.O.E. vocational course numbering scheme.
2. Vocational courses should be related to programs that relate to U. S. Department of Labor Occupation codes.
3. Vocational courses at the secondary school level, except in a few instances, seem to be more job orientation than job entry training. If that unplanned observation is correct, then vocational program specialists need to investigate the degree of program articulation between secondary and postsecondary offerings and to identify the nature of skill transfers between occupations.
4. A need for a common definition of "basic" program exists. Although the data available required a compromise for purposes of this project that compromise is not satisfactory for management purposes.

Conclusions -- Student Accounting

1. The various bases of student accounting utilized by secondary and postsecondary agencies are incompatible for purposes of inter-organization comparisons.

2. The average-daily-attendance method of student accounting does not relate to vocational program instruction tasks or to resource needs to accommodate those tasks.

3. Student contact hours is the best student accounting method for measuring program participation units and for computing full-time equivalent students.

Conclusions -- Fiscal Accounting

1. Objects-of-expenditures provide the common basic structure for relating expenditures to courses and program areas. Identification of expenditure functions may be very helpful in identifying "basic" program costs.

2. Generally, any attempt to isolate costs of special education for the handicapped would require a similar application of the cost model reported in Chapter 4.

3. Data are not generally available and would require extensive auditing to determine both value of capital investments by vocational program area and to relate time-space utilized for purposes of prorating costs to program.

4. Generally better data bases exist at the postsecondary institutions and execpt in two cases, the basic program costs per student were not generally greater than the secondary program basic student costs.

5. The data elements of interest utilized in the cost model may be determined at both secondary and postsecondary sites irrespective of their fiscal accounting basis and sophistication.